PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 036179PCT-475387-5	**FOR FURTHER ACTION**	See Form PCT/IPEA/416
International application No. PCT/US2004/029148	International filing date *(day/month/year)* 08.09.2004	Priority date *(day/month/year)* 27.10.2003

International Patent Classification (IPC) or national classification and IPC
G01B9/02, A61B5/00

Applicant
THE GENERAL HOSPITAL CORPORATION et al.

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 8 sheets, including this cover sheet.
3. This report is also accompanied by ANNEXES, comprising:
   a. ☒ *sent to the applicant and to the International Bureau)* a total of 14 sheets, as follows:
      ☒ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
      ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.
   b. ☐ *(sent to the International Bureau only)* a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

4. This report contains indications relating to the following items:

☒	Box No. I	Basis of the opinion
☐	Box No. II	Priority
☒	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
☐	Box No. IV	Lack of unity of invention
☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
☐	Box No. VI	Certain documents cited
☐	Box No. VII	Certain defects in the international application
☐	Box No. VIII	Certain observations on the international application

Date of submission of the demand	Date of completion of this report
23.08.2005	24.10.2005

Name and mailing address of the international preliminary examining authority:

European Patent Office
D-80298 Munich
Tel. +49 89 2399 - 0 Tx: 523656 epmu d
Fax: +49 89 2399 - 4465

Authorized Officer

Schmidt, C.

Telephone No. +49 89 2399-2254

Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

   ☐ This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:

   ☐ international search (under Rules 12.3 and 23.1(b))
   ☐ publication of the international application (under Rule 12.4)
   ☐ international preliminary examination (under Rules 55.2 and/or 55.3)

2. With regard to the **elements*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

   Description, Pages

   1-49 as originally filed

   Claims, Numbers

   1-95 received on 02.09.2005 with letter of 23.08.2005

   Drawings, Sheets

   1/24-24/24 as originally filed

   ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. ☐ The amendments have resulted in the cancellation of:

   ☐ the description, pages
   ☐ the claims, Nos.
   ☐ the drawings, sheets/figs
   ☐ the sequence listing *(specify)*:
   ☐ any table(s) related to sequence listing *(specify)*:

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

   ☐ the description, pages
   ☐ the claims, Nos.
   ☐ the drawings, sheets/figs
   ☐ the sequence listing *(specify)*:
   ☐ any table(s) related to sequence listing *(specify)*:

* *If item 4 applies, some or all of these sheets may be marked "superseded."*

Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

1. The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non-obvious), or to be industrially applicable have not been examined in respect of:

☐ the entire international application,

☒ claims Nos. 19,71-79 (all in part), 94, 95

because:

☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination (specify):

☐ the description, claims or drawings *(indicate particular elements below)* or said claims Nos. are so unclear that no meaningful opinion could be formed *(specify)*:

☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed.

☒ no international search report has been established for the said claims Nos. 19,71-79 (all in part), 94, 95

☐ the nucleotide and/or amino acid sequence listing does not comply with the standard provided for in Annex C of the Administrative Instructions in that:

the written form	☐	has not been furnished
	☐	does not comply with the standard
the computer readable form	☐	has not been furnished
	☐	does not comply with the standard

☐ the tables related to the nucleotide and/or amino acid sequence listing, if in computer readable form only, do not comply with the technical requirements provided for in Annex C-*bis* of the Administrative Instructions.

☐ See separate sheet for further details

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-18, 19 (in part), 20, 27-44, 46-70, 71-79 (in part), 81-93
	No:	Claims	21-26, 45, 80
Inventive step (IS)	Yes:	Claims	none
	No:	Claims	1-18, 19(in part), 20-70, 71-79(in part), 80-93
Industrial applicability (IA)	Yes:	Claims	1-93
	No:	Claims	

2. Citations and explanations (Rule 70.7):

see separate sheet

Cited documents

D1: WO 98/35203 A (MASSACHUSETTS INSTITUTE OF TECHNOLOGY) 13 August 1998 (1998-08-13)
D2: WO 97/32182 A (MASSACHUSETTS INSTITUTE OF TECHNOLOGY) 4 September 1997 (1997-09-04)
D3: WO 92/19930 A (MASSACHUSETTS INSTITUTE OF TECHNOLOGY; SWANSON, ERIC, A) 12 November 1992 (1992-11-12)
D4: WO 00/58766 A (SCIMED LIFE SYSTEMS, INC) 5 October 2000 (2000-10-05)
D5: US-B1-6 501 551 (TEARNEY GUILLERMO ET AL) 31 December 2002 (2002-12-31)
D6: US-A-4 601 036 (FAXVOG ET AL) 15 July 1986 (1986-07-15)
D7: US-A-4 868 834 (FOX ET AL) 19 September 1989 (1989-09-19)
D8: EP-A-0 251 062 (FUJITSU LIMITED) 7 January 1988 (1988-01-07)
D9: US 2003/023153 A1 (IZATT JOSEPH A ET AL) 30 January 2003 (2003-01-30)
D10: US-B1-6 341 036 (TEARNEY GUILLERMO J ET AL) 22 January 2002 (2002-01-22)

Section III

Claims 19 and 71-79 do not meet the requirements of Article 6 PCT in that the matter for which protection is sought is not clearly defined. The claims attempt to define the subject-matter in terms of the result to be achieved, which merely amounts to a statement of the underlying problem, without providing the technical features necessary for achieving this result.
For the purposes of the search and examination these claims have been interpreted as comprising the features of the embodiment with the grating and rotating polygon as shown eg in figure 6, which according to the description seems to be the features which can enable the desired result.

Claims 94 and 95: the feature of 15.7 kHz was neither present in the original claims nor indicated in the description as an important feature and was thus not subject to the search under Chapter I. Therefore no opinion can be given on these claims.

Section V

1. The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claim 1 does not involve an inventive step in the sense of Article 33(3) PCT.

D1 discloses an apparatus comprising (see figure 1 and page 3, line 10 to page 4, line 2):
-a first arrangement (tunable laser 14) providing one first radiation to a sample (the optical path leading to sample 38) and a second radiation to a reference (optical path leading to reference mirror 34); wherein a frequency of radiation provided by the first arrangement varies over time (frequency tuned laser 14);
-at least one second arrangement detecting an interference between a third and a fourth radiation associated with the first and second electromagnetic radiations (interferometer 18);

The subject-matter of present claim 1 differs from the known apparatus in that the reference is defined as being "non-reflective". However, this cannot be considered inventive, since it is well known in the art to have both a reflective or a non-reflective reference sample, depending on the kind of reference. However, the important feature is that the beams are made to interfere with each other. Thus, if the reference is non-reflective it either has to have a mirror behind it or the optical path must be made so that the beams can recombine. These are however, well known constructional features of an interferomer.

It should further be noted that the broad wording of the claims are not limited to a particular device such as an OCT but can be read onto a variety of known interferometer devices used in different technical fields.

The same objection is raised against corresponding method claim 20.

2. With respect to the further independent claims the following objections occur:

Claims 21 and 45: these claims differ from claim 1 in that (i) the reference is not defined as non-reflective and (ii) the feature that "the spectrum contains multiple differeing longitudinal modes". As stated above D1 discloses a reflective reference so that feature (i) is not novel over D1. Further, also in D1 there are different longitudinal modes in the spectrum which is made by a frequency-tuned laser (see Abstract). Thus, these claims are not novel over D1.

Claims 46 and 69: these claims differ from claim 1 in that (i) the reference is not defined as non-reflective and (ii) the feature of using two different polarization states. Feature (i) is disclosed in D1 as outlined above. The use of polarization is common practice in OCT systems (see eg D3, figure 11) and thus these claims are not considered inventive.

Claims 71 and 79: as stated above under Section III these claims have been interpreted as comprising the rotating polygon and grating arrangement. However, as can be seen from documents D6 to D8 such arrangements are well known in the art.

Claim 80: differs from claim 1 in that a further arrangement for shifting the frequency is included. However, such arrangements are standard in OCT technique and is also mentioned eg in D1, figure 6, element 320.

Claims 81, 92 and 93: these claims include further to the features of claim 1 the feature of sampling the data in a first format and then transferring this data to a second format. This is mainly done in order to provide linearity. However, such format changing is well known in the art of sampling techniques (see also D3 and D9).

3. The dependent claims do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of novelty and/or inventive step, since they all relate to different well known features of OCT systems:

Frequency shifting is generally known as stated above.

The use of a transverse scanning probe is already known from D1, figure 1. Further , as shown in document D4 also rotary probes with fibre-optic catheter is well known.

The use of a bandpass filter is a standard technique, see eg D3.

A dual balanced receiver is eg disclosed in D1, p. 8, line 18.

Polarization measuring techniques are eg known from D3, figure 11 (see also D8, figure 7).

Phase shifting techniques are known eg from D1.
The tuning rates mentioned are also inherent in the rotating polygon arrangements of the prior art.

A semiconductor gain medium is eg disclosed in D1, p. 4, line 19.

The sampling techniques defined are all standard in the art of sampling of measurement data. Reference is also made to D1, D3 and D9.

CLAIMS

1. An apparatus comprising:

at least one first arrangement providing at least one first electro-magnetic radiation to a sample and at least one second electro-magnetic radiation to a non-reflective reference, wherein a frequency of radiation provided by the at least one first arrangement varies over time; and

at least one second arrangement detecting an interference between at least one third radiation associated with the at least one first radiation and at least one fourth radiation associated with the at least one second radiation.

2. The apparatus according to claim 1, wherein the at least one third radiation is a radiation returned from the sample, and the at least one fourth radiation is a radiation returned from the reference.

3. The apparatus according to claim 1, further comprising at least one third arrangement for shifting the frequency of at least one of the at least one first electro-magnetic radiation, the at least one second electromagnetic radiation, the at least one third electro-magnetic radiation or the at least one fourth electro-magnetic radiation.

4. The apparatus according to claim 1, further comprising at least one third arrangement generating an image based on the detected interference.

5. The apparatus according to claim 4, further comprising a probe which scans a transverse location of the sample to generate scanning data, and which provides the scanning data to the third arrangement so as to generate the image.

6. The apparatus according to claim 5, wherein the scanning data includes the detected interference obtained at multiple transverse locations on the sample.

7. The apparatus according to claim 1, wherein at least one second arrangement comprises at least one photodetector and at least one electrical filter which follows the at least one photodetector.

SUPPLEMENTAL SHEETS

8. The apparatus according to claim 3, wherein at least one second arrangement comprises at least one photodetector and at least one electrical filter which follows the at least one photodetector.

9. The apparatus according to claim 8, wherein the at least one electric filter is a bandpass filter having a center frequency that is approximately the same as a magnitude of the frequency shift by the frequency shifting arrangement.

10. The apparatus according to claim 9, wherein a transmission profile of the electrical filter varies substantially over its passband.

11. The apparatus according to claim 5, wherein the probe comprises a rotary junction and a fiber-optic catheter.

12. The apparatus according to claim 11, wherein the catheter is rotated at a speed higher than 30 revolutions per second.

13. The apparatus according to claim 1, further comprising at least one polarization modulator.

14. The apparatus according to claim 1, wherein the at least one second arrangement is capable of detecting a polarization state of at least one of the first and second electromagnetic radiation.

15. The apparatus according to claim 1, wherein the at least one second arrangement comprises at least one dual balanced receiver.

16. The apparatus according to claim 1, wherein the at least one second arrangement comprises at least one polarization diverse receiver.

17. The apparatus according to claim 1, wherein the at least one second arrangement comprises at least one polarization diverse and dual balanced receiver.

18. The apparatus according to claim 1, further comprising at least one third arrangement for tracking the phase difference between at least one of:

- the at least one first electromagnetic radiation and the at least one second electromagnetic radiation, and
- the at least one third electromagnetic radiation and the at least one fourth electromagnetic radiation.

19. The apparatus according to claim 1, further comprising an arrangement emitting a particular radiation which is provided to the at least one first arrangement when the at least one first arrangement provides the first and second electro-magnetic radiations based on the particular radiation, wherein at least one of the first and second electro-magnetic radiations has a spectrum whose mean frequency changes substantially continuously over time at a tuning speed that is greater than 100 Tera Hertz per millisecond.

20. A method comprising the steps of:

providing at least one first electro-magnetic radiation to a sample and at least one second electro-magnetic radiation to a non-reflective reference, wherein a frequency of the at least one of the first and second radiations varies over time; and

detecting an interference between at least one third radiation associated with the at least one first radiation and at least one fourth radiation associated with the at least one second radiation.

21. An apparatus comprising:

at least one first arrangement providing at least one first electro-magnetic radiation to a sample and at least one second electro-magnetic radiation to a reference, wherein at least one of the first and second electro-magnetic radiations has a spectrum which changes over time, the spectrum containing multiple differing longitudinal modes; and

at least one second arrangement detecting an interference between at least one third radiation associated with the at least one first radiation and at least one fourth radiation associated with the at least one second radiation.

22. The apparatus according to claim 21, wherein the at least one third radiation is a radiation returned from the sample, and the at least one fourth radiation is a radiation returned from the reference.

23. The apparatus according to claim 21, further comprising at least one third arrangement for shifting the frequencies of at least one of the at least one first electro-magnetic radiation, the at least one second electromagnetic radiation, the at least one third electro-magnetic radiation and the at least one fourth electromagnetic radiation.

24. The apparatus according to claim 21, further comprising at least one third arrangement generating an image based on the detected interference.

25. The apparatus according to claim 24, further comprising a probe which scans a transverse location of the sample to generate scanning data, and which provides the scanning data to the third arrangement so as to generate the image.

26. The apparatus according to claim 25, wherein the scanning data includes the detected interference obtained at multiple transverse locations on the sample.

27. The apparatus according to claim 21, wherein the reference is non-reflective.

28. The apparatus according to claim 21, wherein a median of the spectrum varies substantially linearly over time.

29. The apparatus according to claim 28, wherein a rate of change of the median of the spectrum is at least 1000nm/msec.

30. The apparatus according to claim 21, wherein the spectrum change over time repetitively with a repetition rate of at least 10 kHz.

31. The apparatus according to claim 21, wherein the at least one first arrangement includes a spectral filter to vary the spectrum over time.

SUPPLEMENTAL SHEETS

32. The apparatus according to claim 31, wherein the spectral filter includes a polygon scanner and a spectral separating arrangement that vary the spectrum over time.

33. The apparatus according to claim 21, wherein the at least one first arrangement includes a semiconductor gain medium at least one of generating and amplifying an electro-magnetic radiation.

34. The apparatus according to claim 23, wherein at least one second arrangement comprises at least one photodetector and at least one electrical filter which follows the at least one photodetector.

35. The apparatus according to claim 34, wherein the at least one electric filter is a bandpass filter having a center frequency that is approximately the same as a magnitude of the frequency shift by the frequency shifting arrangement.

36. The apparatus according to claim 35, wherein a transmission profile of the electrical filter varies substantially over its passband.

37. The apparatus according to claim 25, wherein the probe comprises a rotary junction and a fiber-optic catheter.

38. The apparatus according to claim 37, wherein the catheter is rotated at a speed higher than 30 revolutions per second.

39. The apparatus according to claim 21, further comprising at least one polarization modulator.

40. The apparatus according to claim 21, wherein the at least one second arrangement is capable of detecting a polarization state of at least one of the first and second electromagnetic radiation.

41. The apparatus according to claim 21, wherein the at least one second arrangement comprises at least one dual balanced receiver.

SUPPLEMENTAL SHEETS

42. The apparatus according to claim 21, wherein the at least one second arrangement comprises at least one polarization diverse receiver.

43. The apparatus according to claim 21, wherein the at least one second arrangement comprises at least one polarization diverse and dual balanced receiver.

44. The apparatus according to claim 21, further comprising at least one third arrangement for tracking the phase difference between at least one of:

- the at least one first electromagnetic radiation and the at least one second electromagnetic radiation, and
- the at least one third electromagnetic radiation and the at least one fourth electromagnetic radiation.

45. A method comprising the steps of:

providing at least one first electro-magnetic radiation to a sample and at least one second electro-magnetic radiation to a reference, wherein at least one of the first and second electro-magnetic radiation has a spectrum which changes over time, the spectrum containing multiple differing longitudinal modes; and

detecting an interference between at least one third radiation associated with the at least one first radiation and at least one fourth radiation associated with the at least one second radiation.

46. An apparatus comprising:

at least one first arrangement providing at least one first electro-magnetic radiation to a sample and at least one second electro-magnetic radiation to a reference, wherein a frequency of radiation provided by the at least one first arrangement varies over time;

at least one second arrangement detecting a first interference signal between at least one third radiation associated with the at least one first radiation and at least one fourth radiation associated with the at least one second radiation in a first polarization state; and

at least one third arrangement detecting a second interference signal between the third and fourth electro-magnetic radiations in a second polarization state, wherein the first and second polarization states being different from one another.

47. The apparatus according to claim 46, wherein the at least one third radiation is a radiation returned from the sample, and the at least one fourth radiation is a radiation returned from the reference.

48. The apparatus according to claim 46, further comprising at least one fourth arrangement configured to shift the frequency of at least one of the at least one first electro-magnetic radiation, the at least one second electromagnetic radiation, the at least one third electro-magnetic radiation and the at least one fourth electro-magnetic radiation.

49. The apparatus according to claim 46, further comprising at least one fourth arrangement generating an image based on the detected interference.

50. The apparatus according to claim 49, further comprising a probe which scans a transverse location of the sample to generate scanning data, and which provides the scanning data to the fourth arrangement so as to generate the image.

51. The apparatus according to claim 50, wherein the scanning data includes the detected interference obtained at multiple transverse locations on the sample.

52. The apparatus according to claim 46, wherein the reference is non-reflective.

53. The apparatus according to claim 46, wherein a median of the spectrum varies substantially linearly over time.

54. The apparatus according to claim 46, wherein the at least one first arrangement includes a spectral filter to vary the spectrum over time.

55. The apparatus according to claim 54, wherein the spectral filter includes a polygon scanner and a spectral separating arrangement that vary the spectrum over time.

SUPPLEMENTAL SHEETS

56. The apparatus according to claim 46, wherein the at least one first arrangement includes a semiconductor gain medium at least one of generating and amplifying an electro-magnetic radiation.

57. The apparatus according to claim 46, further comprising at least one fourth arrangement generating an image based on the detected interference, wherein the first and second polarization states are approximately orthogonal to one another.

58. The apparatus according to claim 48, wherein at least one second arrangement comprises at least one photodetector and at least one electrical filter which follows the at least one photodetector.

59. The apparatus according to claim 58, wherein the at least one electric filter is a bandpass filter having a center frequency that is approximately the same as a magnitude of the frequency shift by the frequency shifting arrangement.

60. The apparatus according to claim 59, wherein a transmission profile of the electrical filter varies substantially over its passband.

61. The apparatus according to claim 50, wherein the probe comprises a rotary junction and a fiber-optic catheter.

62. The apparatus according to claim 62, wherein the catheter is rotated at a speed higher than 30 revolutions per second.

63. The apparatus according to claim 46, further comprising at least one polarization modulator.

64. The apparatus according to claim 46, wherein the at least one second arrangement is capable of detecting a polarization state of at least one of the first and second electromagnetic radiation.

SUPPLEMENTAL SHEETS

65. The apparatus according to claim 46, wherein the at least one second arrangement comprises at least one dual balanced receiver.

66. The apparatus according to claim 46, wherein the at least one second arrangement comprises at least one polarization diverse receiver.

67. The apparatus according to claim 46, wherein the at least one second arrangement comprises at least one polarization diverse and dual balanced receiver.

68. The apparatus according to claim 46, further comprising at least one third arrangement for tracking the phase difference between at least one of:

- the at least one first electromagnetic radiation and the at least one second electromagnetic radiation, and
- the at least one third electromagnetic radiation and the at least one fourth electromagnetic radiation.

69. A method comprising the steps of:

providing at least one first electro-magnetic radiation to a sample and at least one second electro-magnetic radiation to a reference, wherein a frequency of the at least one of the first and second radiations varies over time;

detecting a first interference signal between at least one third radiation associated with the at least one first radiation and at least one fourth radiation associated with the at least one second radiation in a first polarization state; and

detecting a second interference signal between the third and fourth electro-magnetic radiations in a second polarization state, wherein the first and second polarization states being different from one another.

70. The method according to claim 69, wherein the at least one third radiation is a radiation returned from the sample, and the at least one fourth radiation is a radiation returned from the reference.

71. An apparatus comprising:

at least one first arrangement providing at least one first electro-magnetic radiation to a sample and at least one second electro-magnetic radiation to a reference, wherein at least one of the first and second electro-magnetic radiations has a spectrum whose mean frequency changes substantially continuously over time at a tuning speed that is greater than 100 Tera Hertz per millisecond; and

at least one second arrangement detecting an interference between at least one third radiation associated with the at least one first radiation and at least one fourth radiation associated with the at least one second radiation.

72. The apparatus according to claim 71, wherein the mean frequency changes repeatedly at a repetition rate that is greater than 5 kilo Hertz.

73. The apparatus according to claim 71, wherein the mean frequency changes over a range that is greater than 10 Tera Hertz.

74. The apparatus according to claim 71, wherein the spectrum has an instantaneous line width that is smaller than 100 Giga Hertz.

75. The apparatus according to claim 71, further comprising a laser cavity with a roundtrip length shorter than 5 m.

76. The apparatus according to claim 73, the center of the tuning range of the spectrum is nominally centered at 1300 nm.

77. The apparatus according to claim 73, the center of the tuning range of the spectrum is nominally centered at 850 nm.

78. The apparatus according to claim 73, the center of the tuning range of the spectrum is nominally centered at 1700 nm.

79. A method comprising the steps of:

providing at least one first electro-magnetic radiation to a sample and at least one second electro-magnetic radiation to a reference, wherein at least one of the first and second electro-magnetic radiations has a spectrum whose mean frequency

changes substantially continuously over time at a tuning speed that is greater than 100 Tera Hertz per millisecond; and

detecting an interference between at least one third radiation associated with the at least one first radiation and at least one fourth radiation associated with the at least one second radiation.

80. An apparatus comprising:

at least one first arrangement providing at least one first electro-magnetic radiation to a sample and at least one second electro-magnetic radiation to a reference, wherein a frequency of radiation provided by the at least one first arrangement varies over time;

at least one second arrangement adapted for shifting the frequency of the at least one first electro-magnetic radiation and the at least one second electromagnetic radiation;

an interferometer interfering the first and second electro-magnetic radiations to produce an interference signal; and

at least one second arrangement detecting the interference between the first and second electro-magnetic radiations.

81. A system for determining particular data associated with at least one of a structure and composition of a tissue, comprising:

a processing arrangement, which when executing a predetermined technique, is configured to:

a) receive information associated with an interferometric signal which is formed from at least one first electro-magnetic radiation obtained from a sample and at least one second electro-magnetic radiation obtained from a reference, wherein at least one of the first and second electro-magnetic radiations is frequency-shifted,

b) sample the information to generate sampled data in a first format, and

c) transform the sampled data into the particular data that is in a second format, the first and second format being different from one another.

82. The system according to claim 81, wherein the second format has at least two sampling intervals representing substantially the same electro-magnetic frequency difference.

83. The system according to claim 82, wherein each of the sampling intervals represents substantially the same electro-magnetic frequency difference.

84. The system according to claim 81, wherein procedure (c) includes interpolating the sampled data.

85. The systems according to claim 84, wherein at least one of the first and second electro-magnetic radiations is frequency-shifted by a particular frequency, and wherein the interpolation includes Fourier transforming the sampled data into an array in a frequency domain and separating the array into at least two frequency bands based on the particular frequency.

86. The system according to claim 85, wherein the interpolation includes Fourier transforming the sampled data into an array in a frequency domain, and increasing a size of the array and inserting a predetermined value into each element of an increased portion of the array.

87. The system according to claim 81, wherein the processing arrangement is further configured to generate an image of at least one portion of the tissue based on the particular data.

88. The system according to claim 87, wherein the image has a particular resolution, wherein a spectrum of electro-magnetic frequencies associated with the sampled data relates to the particular resolution, and wherein the particular resolution is substantially proximal to a Fourier Transform limit of the spectrum of the electro-magnetic frequencies.

89. The system according to claim 85, wherein the second format has at least two sampling intervals representing substantially the same electro-magnetic frequency

difference, and wherein a magnitude of the particular frequency is greater than approximately a quarter of a reciprocal of at least one of the sampling intervals.

90. The system according to claim 87, wherein the second format is an image format, and wherein the image is based on the transformed sampled data.

91. The system according to claim 84, wherein the second format is a format that includes approximately constant k-space intervals.

92. A method for determining particular data associated with at least one of a structure and composition of a tissue, comprising the steps:

receiving information associated with an interferometric signal which is formed from at least one first electro-magnetic radiation obtained from a sample and at least one second electro-magnetic radiation obtained from a reference, wherein at least one of the first and second electro-magnetic radiations is frequency-shifted;

sampling the information to generate sampled data in a first format; and

transforming the sampled data into the particular data that is in a second format, the first and second format being different from one another.

93. Storage medium for determining particular data associated with at least one of a structure and composition of a tissue, the storage medium maintaining a program thereon which, when executed by a processing arrangement is configured to perform instructions comprising::

receiving information associated with an interferometric signal which is formed from at least one first electro-magnetic radiation obtained from a sample and at least one second electro-magnetic radiation obtained from a reference, wherein at least one of the first and second electro-magnetic radiations is frequency-shifted;

sampling the information to generate sampled data in a first format; and

transforming the sampled data into the particular data that is in a second format, the first and second format being different from one another.

94. An apparatus comprising:

at least one first arrangement providing at least one first electro-magnetic radiation to a sample and at least one second electro-magnetic radiation to a reference,

wherein at least one of the first and second electro-magnetic radiations has a spectrum whose mean frequency changes substantially continuously at a repetition rate of approximately 15.7 KHertz; and

at least one second arrangement detecting an interference between at least one third radiation associated with the at least one first radiation and at least one fourth radiation associated with the at least one second radiation.

95. A method comprising the steps of:

providing at least one first electro-magnetic radiation to a sample and at least one second electro-magnetic radiation to a reference, wherein at least one of the first and second electro-magnetic radiations has a spectrum whose mean frequency changes substantially continuously over time at a repetition rate of approximately 15.7 KHertz; and

detecting an interference between at least one third radiation associated with the at least one first radiation and at least one fourth radiation associated with the at least one second radiation.